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Research Abstracts

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CURRENT NACA REPORTS

NACA Rept. 1012

INVESTIGATION OF THE NACA 4-(5)(08)-03 AND NACA 4-(10)(08)-03 TWO-BLADE PROPELLERS AT FORWARD MACH NUMBERS TO 0.725 TO DETERMINE THE EFFECTS OF CAMBER AND COMPRESSIBILITY ON PERFORMANCE. James B. Delano. 1951. 31p. photos., diagrs. (NACA Rept. 1012. Formerly ACR L5F15)

The effects of blade section and camber and compressibility on propeller characteristics are presented for forward Mach numbers from 0.165 to 0.725 for blade angles from 20° to 60°. The camber-range investigated corresponds to section design lift coefficients of 0.3, 0.5, and 1.0.

NACA TN 2508

LANDING CHARACTERISTICS IN WAVES OF THREE DYNAMIC MODELS OF FLYING BOATS. James M. Benson, Robert F. Havens and David R. Woodward. January 1952. 41p. diagrs., photo., 2 tabs. (NACA TN 2508. Formerly RM L6L13)

Powered models of three different flying boats were landed in oncoming waves of various heights and lengths. The effects of varying the trim at landing, the deceleration after landing, and the size of the waves were determined. Data are presented on the motions and accelerations obtained during landings in rough water.

NACA TN 2538

MECHANICAL AND CORROSION TESTS OF SPOT-WELDED ALUMINUM ALLOYS. Fred M. Reinhart, National Bureau of Standards, and W. F. Hess, R. A. Wyant, F. J. Winsor and R. R. Nash, Rensselaer Polytechnic Institute. December 1951. 74p. diagrs., photos., 19 tabs. (NACA TN 2538)

Corrosion behavior of spot-welded aluminum-alloy (alclad 24S-T3, 24S-T3, alclad XB75S-T6, XB75S-T6, and R-301-T6) panels of varying weld quality was determined. Tidewater and weather exposure tests were made and the results were evaluated largely in terms of distribution of corrosion products and effects on weld strength. Metallographic examinations of several of the alloys were also made to determine the extent and type of corrosion attack associated with various welding and exposure conditions.

NACA TN 2573

DEVELOPMENT OF AUXILIARY CYCLOTRON EQUIPMENT FOR USING TRITIUM AS BOMBARDING PARTICLES IN A CYCLOTRON. D. N. Kundu, F. G. Boyle and M. L. Pool, Ohio State University. December 1951. 19p. diagrs. (NACA TN 2573)

A circulating system for radioactive tritium was constructed, assembled, and tested. The results showed that the pumping speed of the system was too low for use. With a sufficiently increased pumping speed, it is believed that the circulating system would provide satisfactory operation.

NACA TN 2574

THEORETICAL ANALYSIS OF SOME SIMPLE TYPES OF ACCELERATION RESTRICTORS. William H. Phillips. December 1951. 35p. diagrs., 2 tabs. (NACA TN 2574)

Acceleration restrictors which work on the principle of stopping the upward motion of the elevator when the signal from an acceleration-sensing device reaches a certain value have been analyzed for representative fighter and transport airplanes over a range of altitude and center-of-gravity positions.

NACA TN 2575

A FLIGHT INVESTIGATION OF THE EFFECT OF CENTER-OF-GRAVITY LOCATION ON GUST LOADS. Jack Funk and Earle T. Binckley. December 1951. 18p. diagrs., 3 tabs. (NACA TN 2575)

Two jet-propelled airplanes were flown in rough air to investigate the effects of center-of-gravity location on gust loads. Data were obtained at centers of gravity of 20.9 and 27.5 percent mean aerodynamic chord for incremental load factor up to 1 g. The results indicate that a 6.6-percent forward movement of center of gravity decreases the gust loads by approximately 10 percent. The most frequently occurring distance from 1 g to peak acceleration was 17.5 chords. Calculations of the change in normal acceleration for a center-of-gravity movement from 20.9 to 27.5 percent mean aerodynamic chord for a single triangular gust having a gradient distance of 17.5 chords were in good agreement with the test results.

NACA TN 2581

DEFLECTIONS OF A SIMPLY SUPPORTED RECTANGULAR SANDWICH PLATE SUBJECTED TO TRANSVERSE LOADS. Kuo Tai Yen, Sadettin Gunturkun and Frederick V. Pohle, Polytechnic

Institute of Brooklyn. December 1951. 39p. curves, diagrs., 3 tabs. (NACA TN 2581)

The differential equations of the bending of sandwich plates were integrated to obtain the deflections when the four edges of the plate are simply supported and the loading consists of either a uniformly distributed transverse load or a concentrated load applied at the center of the panel. The deflection patterns are shown in diagrams and the maximum deflection of the plate is presented in a number of graphs.

NACA TN 2582

GENERAL CONSIDERATION OF PROBLEMS IN COMPRESSIBLE FLOW USING THE HODOGRAPH METHOD. Chieh-Chien Chang, Johns Hopkins University. January 1952. 113p. diagrs. (NACA TN 2582)

This is an investigation of the hodograph method as it is applied in general to the problem of compressible flow. The hodograph equations are given in various canonical forms convenient for obtaining solutions in the different flow regimes. However, since the coefficients of the canonical differential equations are implicit functions and therefore exact solutions are difficult to find, different approximations are chosen so that simpler differential equations can be obtained. The detailed development is concentrated on Chaplygin's second equation. The first-order approximation is well known as the Tricomi equation; the second- and third-order approximations follow the exact gas law closely in the neighborhood of sonic velocity. The flow through an aperture is reexamined by comparing the present approximate relation with the exact Chaplygin solutions.

NACA TN 2586

FUNDAMENTAL EFFECTS OF COLD-WORK ON SOME COBALT-CHROMIUM-NICKEL-IRON BASE CREEP-RESISTANT ALLOYS. D. N. Frey, J. W. Freeman and A. E. White, University of Michigan. January 1952. 12p. diagrs. (NACA TN 2586)

The influence of cold-working on creep properties of an alloy containing 20-percent cobalt, 20-percent chromium, 20-percent nickel, and the balance iron and on the same alloy modified by small additions of tungsten alone or tungsten, molybdenum, and columbium in combination was studied. Effects of cold-working on creep resistance were the same for all alloys studied for temperatures up to 1600° F and reductions between 15 and 40 percent. Conclusions were reached by studying creep properties and also internal stress relaxation at test temperatures which previous work had shown to be the controlling factor in response of such alloys to cold-working.

NACA TN 2587

INFLUENCE OF WING AND FUSELAGE ON THE VERTICAL-TAIL CONTRIBUTION TO THE LOW-SPEED ROLLING DERIVATIVES OF MIDWING AIRPLANE MODELS WITH 45° SWEPTBACK SURFACES. Walter D. Wolhart. December 1951. 55p. diagrs., photo., 3 tabs. (NACA TN 2587)

Results are presented of an investigation to determine the influence of the wing and fuselage on the vertical-tail contribution to the rolling derivatives of midwing airplane models with 45° sweptback surfaces. Comparisons are also made between measured and calculated vertical-tail contributions to the rolling derivatives which include corrections for the effect of fuselage and wing sidewash due to roll.

NACA TN 2589

AN ANALYTICAL INVESTIGATION USING AERODYNAMIC LIMITATIONS OF SEVERAL DESIGNS OF HIGH STAGE PRESSURE RATIO MULTISTAGE COMPRESSORS. Charles H. Voit and Arthur R. Thomson. December 1951. 56p. diagrs., 2 tabs. (NACA TN 2589)

An analysis of the effect of the principal design variables on the stagewise design-point characteristics of axial-flow compressors having high average stage pressure ratios was made. The investigation considered certain design limits and the manner in which they are affected by the principal design variables. Optimum stagewise variations of axial velocity and relative inlet-air angle were determined. An estimate was made of the obtainable over-all total pressure ratio by the use of several stagewise distributions of these variables.

NACA TN 2595

DESIGN OF TWO-DIMENSIONAL CHANNELS WITH PRESCRIBED VELOCITY DISTRIBUTIONS ALONG THE CHANNEL WALLS. II - SOLUTION BY GREEN'S FUNCTION. John D. Stanitz. January 1952. 35p. diagrs., 2 tabs. (NACA TN 2595)

Methods of solution by Green's function are developed for the design of two-dimensional unbranched channels with prescribed velocities as a function of arc length along the channel walls. The methods apply to incompressible and linearized compressible, nonviscous irrotational flow. One numerical example is presented for an accelerating elbow with linearized compressible flow. The elbow shape obtained from the solution by Green's function is the same as that obtained from a solution by relaxation methods for the same prescribed conditions. The time required for the calculations is considerably less for solutions by Green's function.

NACA TM 1327

CONCERNING THE FLOW ABOUT RING-SHAPED COWLINGS. PART VI - FURTHER MEASUREMENTS ON INLET DEVICES. (Uber die Strömung an ringförmigen Verkleidungen. VI. Mitteilung: Weitere Messungen an Einlaufgeräten). Dietrich Kuchemann and Johanna Weber. December 1951. 21p. diagrs. (NACA TM 1327. Trans. from Zentrale für wissenschaftliches Berichtswesen der Luftfahrtforschung, Berlin. FB 1236/6, March 30, 1942).

The present report presents as a supplement to the fourth report (available as ATI 50545, Air Materiel Command) in the series of investigations concerning the flow about ring-shaped cowlings further wind-

tunnel measurements on inlet devices which are to show the influence of the radius of the nose of the cowling on the flow conditions. Moreover, a simple rule for the design of such arrangements, containing a hub in the interior, is suggested.

UNPUBLISHED PAPERS

N-1873*

A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF PLATES REINFORCED BY RIBS. (Di una ricerca teoricosperimentale sulle piastre con nervature). Elio Giangreco. August 1951. 24p. diagrs., photos. (Trans. from Ingegnere, no.3, March 1950, 8p.).

An experimental investigation of the static reaction of plates reinforced by ribs was made. Results were compared with the theoretical method of Tolotti and Grioli in which several simplifying empirical assumptions of the load distribution were eliminated. Further comparisons were made with a theoretical method usually employed by engineers in which the appraisal of the load transmitted by the plate on the ribs is made by concentrating on the point of intersection of the beams the load acting on a square of equal sides to those of the mesh of the grid and therefore independent of the assumedly effective flange width.

N-3875 *

CERTAIN FUNDAMENTAL PROBLEMS IN THE THEORY OF PLASTICITY. (Nekotorie Osnovnye Zadachi Teorii Plastichnosti). A. A. Ilyushin. THE PROBLEM OF STRENGTH IN MACHINE CONSTRUCTION. (Problema Prochnosti v Mashinostroenii). I. A. Oding. 48p. (Trans. from Akademiia Nauk SSSR, Izvestiia, Otdelenie Tekynicheskikh Nauk, no. 12, December 1949, p. 1753-1787).

The first paper considers the methods for investigating plasticity and critiques the theory of plasticity and the basic problems of plasticity. The second paper discusses the problem of strength in machine design. It includes information on the strength of metals under conditions of cyclic loading and conditions of high temperature.

N-10899*

THIRD APPROXIMATION OF THIN-WING EXPANSION METHOD FOR COMPRESSIBLE FLUIDS. (Chijimu Ryūtai ni Okeru Hakyuokudenkaiho no Dai San Kinji). Isao Imai and Seiichi Oyama. 7p. (Trans. from Tokyo (Imperial) Univ., Institute of Science and Technology, Reports, v. 2, no. 3-4, Mar.-Apr., 1948, p. 37-39).

In a previous paper the thin-wing expansion method was developed with the object of perfecting the two-dimensional wing theory and at that time the computation was carried only to the second approximation. In the present paper the computation is carried to the third approximation and the reader is referred to the previous report for the details of the method. As a concrete example, the flow past a sine-wave shaped wall was investigated and the results are presented herein.

N-10900*

APPROXIMATE SOLUTION TO VISCOUS FLOW AT LOW SPEEDS. I. FLOW PAST CIRCULAR CYLINDER. (Nenseiryutai No Osoi Nagare Ni Taisuru Hitotsu No Kinji Kaiho). Mitsutoshi Kawaguchi. 12p. diagrs., 2 tabs. (Trans. from Tokyo (Imperial) Univ., Institute of Science and Technology, Reports, v. 2, no. 3-4, Mar.-Apr., 1948, p. 33-37).

The stream function for $R = 10$ to $R = 20$ is analytically studied by developing it into a finite number of terms in order to approximately satisfy the Navier-Stokes equation. The results thus obtained may be considered to agree fairly well with experimental results. In the second approximation there was added the condition that the derivative of the equation of motion is satisfied at $r = 1$ but the approximation became impaired for $R > 20$.

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